

TITLE: TRANSFER OF DISULFOTON AND THREE METABOLITES TO
MAINSTREAM CIGARETTE SMOKE

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ABSTRACT: Disulfoton sulfone was the only metabolite of disulfoton found in ground tobacco of cigarettes made from field-treated tobacco which contained <0.02, 0.03, 0.24, and 1.19 ppm disulfoton from respective field treatment levels of the formulation equivalent to 0.0, 3.4, 6.7, and 13.4 kg ai/ha of disulfoton. The butts remaining after these cigarettes were smoked contained <0.04, 0.23, and 1.03 ppm of disulfoton sulfone for the same treatment levels as above, indicating that none of the metabolite from the burning cone accumulated in the butts. Transfer rates in check cigarettes spiked at 5, 10 and 20 ug per cigarette averaged 14.9% for disulfoton, 8.1% for disulfoton oxygen analog, 0.4% for disulfoton oxygen analog sulfone, and 1.5% for disulfoton sulfone. Analyses again showed no accumulation in the butts of the four compounds. Smoking of filter tip cigarettes produced reductions in transfers of analytes to mainstream smoke of 59% for disulfoton, 32% for disulfoton oxygen analog, 41% for disulfoton oxygen analog sulfone, and 6% for disulfoton sulfone. No conversions of one analyte to another during smoking were observed.

REVIEW: Disulfoton [O,O-diethyl S-(2-(ethylthio) ethyl) phosphorodithioate] is a systemic acaricide and insecticide that is applied to soil to protect the tobacco plant. Disulfoton is metabolized in soil by microorganisms to its sulfoxide and sulfone and corresponding oxygen analogs. The purpose of the study was to determine the transfer rate of disulfoton and its metabolites to mainstream smoke and to determine the chemical transformation of disulfoton and its metabolites during smoking. Other studies have shown that organophosphate residues have been found in significant quantities in both mainstream and side-stream smoke.

Mainstream particulates were collected on Cambridge filter pads which were extracted with ethyl acetate, and then analyzed using gas-liquid chromatography with nitrogen. The results show that disulfoton sulfone was the only metabolite detected in field-treated ground tobacco. Disulfoton sulfone was transferred to mainstream cigarette smoke at a rate of 0.9%. Sources of variance which were found to be significant were the compounds used to fortify the cigarettes and the rate of application of these compounds. This study shows that there is some potential for human exposure using disulfoton due to the relatively high transfer rates of disulfoton (14.9%) and disulfoton oxygen analog (8.1%). But, as the authors point out, these two compounds were not found in detectable amounts in field-treated samples. Of the two metabolites with the lowest transfer rates, disulfoton sulfone and disulfoton oxygen analog sulfone, (1.5% and 0.4% respectively), only the sulfone was detected in field-treated tobacco and in mainstream smoke of cigarettes made from such tobacco.

It is unlikely that a person smoking a pack a day of cigarettes manufactured from tobacco treated at the recommended rate for disulfoton would experience any untoward effects due to disulfoton or its metabolites, since cigarettes treated within the recommended levels showed no detectable disulfoton in mainstream smoke.

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